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## **What Computer Science alone isn't likely to tell us about scaling up to display gigapixel-sized images: reaching out to artists**

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Computational scientists at Sandia National Laboratories believe a display system to enable viewing and interaction with gigapixel-sized images will enhance the ability of scientists to gain insight from massively complex data sets that can be understood only through human intuition. Examples of these data sets are supercomputer generated simulations of a fusion energy machine and high-resolution imaging of the space shuttle. The display would provide an overall view of images at a very large scale while allowing viewers to perceive extremely fine detail.

The need to invent a new venue to enable groups of humans to effectively work together while they work with gigapixel images was evident at the first Big Picture Summit meeting, Dec. 8 and 9 of 2004. This meeting was organized by artist-photographer Clifford Ross and co-hosted by the Computer Science Research Institute at Sandia and the Interactive Telecommunications Program at New York University's Tisch School of the Arts. Engineers and scientists have a lot in common with an artist like Clifford Ross and his quest to make his images evoke a powerful emotional response. We want to understand from an intuitive standpoint what it is that enables viewers to gain insight — for example, a visual metaphor that makes a human viewer comfortable and thus better able to interact with an image. Computer science alone is not likely to invent a means for scientists to intuitively comprehend highly complex problems. Rather we look also to both formal studies in psychology (perception, sensation, cognition) and communication (journalism, commercial art, human-computer interface design), and to ideas for what might work inspired by art history, and by practicing artists.

Ultimate performance of many systems designed at Sandia National Laboratories relies on effective performance of a human “in the loop.” That is, regardless of what information is automatically distilled and shown on the gigapixel displays of a future situation room, a decision to evacuate Los Angeles would not be made until the humans responsible understood and made the call. More broadly, for all the mathematical and scientific experimentation Sandia accomplishes, making a scientific discovery is ultimately a human task of gaining insight and understanding.

The idea of reaching out to artists for help with the human in the loop is an idea that is gaining traction at Sandia. If the role for artists were already well established, Sandia could contract for outside help, and could evolve a new balance of skills of our in-house staff. The current staff at Sandia National Laboratories includes only a few artists. The New Mexico Media Industries Strategy Project (NM MISP) may be a means to get artists involved in more projects right now. From the outside, artists surely are amused when they happen upon the garish color schemes and cluttered visualizations that are so typical of scientific and engineering analysis. The NM MISP may be able to yank a few good artists inside, giving them a material opportunity to better arrange for human understanding of complex data. Artistic success will certainly make the good science accessible to more people. More importantly, making the challenge and beauty of the science attractive should draw more creative and talented people into what they otherwise perceive as an oppressively tedious human endeavor. The artist’s challenge isn’t just to put a pretty face on the work for the lay public; a successful invention for human interaction with gigapixel images from numerical simulations and physical experiments on Sandia’s Z-pinch fusion energy machine could be a key element in how the team does their work. Good scientists, who are already remarkable in their ability to find their way to making scientific discoveries, might do better with such an invention. An artist could have a key role in discovering the next oil before life on this planet gets really grim.

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